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SOFT FLOOR COVERING IN THE LOS ANGELES CITY SCHOOL DISTRICTS.

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DESCRIPTORS- *CARPETING, *COSTS, *EVALUATION, *FACILITY CASE STUDIES, *FLOORING, ACOUSTICAL ENVIRONMENT, FACILITY IMPROVEMENT, LEARNING MOTIVATION, MAINTENANCE,

A STUDY REGARDING THE INSTALLATION OF CARPET IN SCHOOLS IS DISCUSSED. THE PURPOSE OF THE STUDY WAS TO HAVE A CONSULTANT REVIEW UNDER THE DIRECTION OF THE DISTRICT BUILDING AND GROUNDS SERVICES ADMINISTRATOR OF THE LOS ANGELES CITY SCHOOL DISTRICTS, THE SOFT FLOOR COVERING INSTALLATIONS AT ARAGON AVENUE AND TWENTY-FOURTH STREET SCHOOLS. SECTIONS INCLUDE--(1) CARPET EXPERIENCE IN THE LOS ANGELES CITY SCHOOL DISTRICT WITH A SUMMARY OF REACTIONS TO TEST INSTALLATIONS, (2) RELATIVE DEVELOPMENT OF STATIC ELECTRICITY, (3) ANTICIPATED LIFE SERVICE, (4) MATERIAL COSTS, (5) REHABILITATION PROJECTS, (6) OPERATION OR CUSTODIAL COSTS, (8) EQUIPMENT REQUIREMENTS, (9) ANNUAL SUPPLY REQUIREMENTS, AND (10) MAINTENANCE OR REPAIRS. ALSO INCLUDED ARE--(1) A SUMMARY OF COST DATA DEVELOPED IN PREVIOUS SECTIONS OF THE REPORT, (2) REACTIONS TO CARPETED CLASSROOMS, AND (3) CONCLUSIONS. CONSIDERATION IN SELECTION OF FLOOR COVERING SHOULD BE GIVEN TO THE FOLLOWING--(1) THE SONIC ENVIRONMENT IN THE CARPETED CLASSROOM IS SUPERIOR TO ONE HAVING RESILIENT FLOORING ACCORDING TO TEACHERS, (2) NOISE TRANSFER FROM SECOND FLOOR TO FIRST FLOOR IS REDUCED WHEN CARPETING IS USED, ALLEVIATING A SOUND INSULATION BLANKET BETWEEN FLOORS, (3) CARPETING OFFERS A BETTER GENERAL APPEARANCE LEVEL THAN VINYL ASBESTOS TILE, (4) AT FIRST THERE IS SOME HESITANCY TO PERFORM REGULAR CLASSROOM TASKS WHICH IS OVERCOME SHORTLY AFTER USE, AND (5) TEACHERS INDICATE THAT THEY BELIEVE A CARPETED ROOM IS MORE CONDUCIVE TO LEARNING. (RK)

ED019827

SOFT FLOOR COVERING

IN THE

LOS ANGELES CITY SCHOOL DISTRICTS

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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A Report

by

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1967

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FOREWORD

The question of carpeting vs. resilient flooring is a perennial one that crops up from time to time.

The past decade has witnessed a remarkable increase in the installation of carpet in schools. It has many advantages, including reduction or elimination of classroom noise at its source; reduction of teacher fatigue; comfort and warmth at the floor level, particularly for primary grades where children sit on the floor a large part of the time; safety in reducing or eliminating slips and falls; and also reducing severity of injuries in falls from whatever cause.

The dignity and prestige of carpet is undisputed but there are widely divergent viewpoints of its cost. The American Carpet Institute has issued several publications including cost data developed by the Industrial Sanitation Counselors, Inc. of Louisville, Kentucky which indicate that despite the higher initial cost of carpet as compared to resilient floor covering the average "annual cost" is approximately 40% lower than for resilient floors. On the other hand, Armstrong Cork Company's publication "A Fresh Look at Flooring Costs," using data obtained from a "Survey of User Experience," concluded the "Total Annual Use Cost of carpet is 2.71 times as high as the Total Annual Use Cost of resilient floors." A study by the Industrial Research Unit of the Wharton School of Finance and Commerce, University of Pennsylvania, indicates that the annual cost of carpet is approximately 81% more than that of resilient flooring.

It is difficult to understand how such widely divergent figures can be applied to the same materials. The difficulty is emphasized in the Armstrong Cork Company report as follows:

> "There are so many variables affecting maintenance costs* that it is virtually impossible to find any degree of consistency. In the Armstrong study, maintenance labor costs ranged from 2.1¢ to 40¢ per square foot. Yet in most cases, these wide variances are most understandable because of the variables involved."

Attention is directed to the following variables:

1. Location (corridor - classroom - offices)
2. Traffic Pattern
3. Level of Cleanliness Desired
4. Color and Design
5. Quality of Flooring Maintained
6. Labor Rates
7. Maintenance Schedules and Methods

An analysis of the data in these studies, as well as data from school districts and other users, pinpoints the necessity of stabilizing the variables and developing data that applies specifically to the particular problem under consideration.

The Los Angeles City School District is concerned with costs in its schools, under its standards of use and care and not of those of the Waldorf Astoria Hotel, industrial plants or office buildings which were used in the major studies in this field.

*The major part of "Maintenance Costs" in the literature in the field is defined as "Operation of Plant" (Custodial Services) in the California School Accounting Manual.

PURPOSE OF THE STUDY

The purpose of this study as set forth in the agreement between the District and the Consultant is as follows:

"The Consultant shall make the following review under the direction of the District Building and Grounds Services Administrator of the soft floor covering installation at Aragon Avenue and Twenty-Fourth Street Schools, plus any other evaluation the Consultant may feel pertinent to the complete review:

"A. Custodial Requirements:

1. Regular cleaning methods and frequency.
2. Special cleaning and/or shampoo frequency.
3. Comparing cost of custodial care of soft floor covering with previous type floors.
4. Types of equipment necessary to perform satisfactorily the custodial requirements.

"B. Maintenance:

Cost and frequency of repairs.

"C. Evaluation:

Compare the cost of the use of soft floor covering with other materials normally used in the rehabilitation of school buildings. Evaluate the reaction to the installation of the principals and teachers, the students and the parent."

CARPET EXPERIENCE IN THE LOS ANGELES CITY SCHOOL DISTRICT

Carpeting has been used in the Los Angeles City School District, to some extent, in executive offices since the 1920's. However, separate cost data on its cost and upkeep has not been kept. While actual book records on carpet life are not available, it is possible to get some data on carpet life from dates of contracts for installation and replacement. The floor covering unit of the Maintenance Branch is nov maintaining records which will be helpful in the future. It also has researched historical data on the most significant carpet installations since the end of World War II.

Of interest is the historical background and experience of the carpeting presently installed in the Realty Branch at the Business offices. These ground floor offices were carpeted to reduce the noise level resulting from street cars and trucks on San Pedro Street. Some salvage carpet was on hand at that time in the floor covering unit. This material had been removed from (1) offices in the Chamber of Commerce Building when the Administrative offices were moved from that building to their present location about 1947 (original purchase 1939-51) and (2) from areas involved in a rearrangement of the offices at the Business Division about 1955 (original purchase 1949-53). Salvage carpet, age unknown but probably averaging about five years' prior use, was installed in various realty agents' offices. This material, after eleven years' additional use, while worn at office entries and on traffic lanes, is still usable. New carpet, similar to "Gropoint" used in the Administrative offices, was also installed in the public space and clerical areas in 1955, where it serves as a corridor to the various realty agents' offices. This material, after eleven years of intensive traffic lane use, while showing wear is still usable.

Also of value, from a standpoint of determining probable life of carpeting, is the experience in the present Administrative offices. Wall-to-wall carpeting was installed in present Board Members' offices in March, 1947. The carpeting was replaced in December, 1961 after a useful life of 14 years.

One of the most significant installations is that in the East Los Angeles College Auditorium. Wall-to-wall carpeting is installed in the lobby and also the aisles in the Auditorium. This carpeting is subject to heavy wear, as well as spot problems from food and drink served in the lobby area during special functions. The carpeting was installed in April of 1951, and after 16 years' usage has every indication of many more years of useful life.

The District started experimenting with carpets as a floor covering in classrooms, corridors, etc., in 1963 - the first installation being Nylotile (carpet tiles) in the kindergarten at San Pedro Street School and the corridor at Carver Junion High. Since that time, other materials have been installed in various school locations for test purposes. These include wool of the Gropoint type similar to that in the Administrative offices, Ozite (a man-made fibre) with a felt like appearance, Nylon broadloom, and Herculon broadloom.

The following is a summary of reactions to the test installations:

Relative Cost - installed on 40 oz. Pad

1.	Wool (Gropoint quality)	$13.50 - $14.00 per sq. yd.
2.	Ozite	5.50 - 6.50 per sq. yd.
3.	Nylon	9.50 - 11.50 per sq. yd.
4.	Herculon (Brampton quality)	6.50 - 7.50 per sq. yd.

General Appearance

1. Wool Gropoint, Nylon, and Herculon Brampton are almost identical in finished appearance.
2. Ozite is definitely inferior in appearance for classroom purposes.

Normal Cleaning

1. Wool Gropoint, Nylon, and Herculon Brampton are readily cleaned with commercial type vacuum cleaners.
2. Czite on a pad can be vacuumed but when the material is laid direct on concrete or wood flooring, it is very difficult to vacuum. The appearance of a newly cleaned room is not comparable to that of other fibres.

Spot Removal

1. Spots of all types were most readily removed from Nylon.
2. Herculon was almost but not quite as easily cleaned of spots as the Nylon.
3. Spots were much more difficult to remove from Wool Gropoint due to the tendency of the wool fibres to absorb moisture.
4. Spots were extremely difficult and in some cases almost impossible to remove from Ozite.

Relative Development of Static Electricity

Many people suffer discomfort when walking on certain floor coverings due to their tendency to develop static electricity and then experience minor electric shocks when coming in contact with a drinking fountain handle, door knobs or other metallic objects.

1. Herculon fabric produces practically no static electricity.
2. Ozite fibres present practically no static problems.
3. Wool, under certain atmospheric conditions, develops static problems.
4. Nylon, as presently manufactured, presents a serious static problem and special treatment of the carpeting is necessary.

ANTICIPATED SERVICE LIFE

The service life of floor coverings depends upon many variables, including quality of the material, amount and type of traffic, how it is maintained, and the user's own definition of what constitutes "worn out" or need for replacement. Industry figures quoted are as follows:

	Service Life in Years	
	Resilient Flooring	Carpet
American Carpet Institute	18	12
Armstrong "Survey of Users' Experience"	20.5	9.9
Wharton School of Finance and Commerce	18	8

Experience of the Los Angeles City School District tends to support the higher figure for each material, namely, 20 years for resilient flooring and 12 years for carpet. While we have exceptions to the 20-year figure for resilient floors, such as a replacement in Business Division elevator flooring within one year, classroom entry areas in schools within 5 years, etc., they are generally special conditions or results of defective workmanship or material and are not representative of average anticipated life of the material concerned. Contracts were recently awarded for replacement of resilient flooring in several schools. The age of material being replaced averaged approximately 20 years. While the District's experience with carpet is much more limited, it would indicate that the 12-year life is not unrealistic based upon the following:

1. East Los Angeles College Auditorium - 16 years - still in use
2. Board and Superintendent's Offices - 14 years - (replaced)
3. Realty Branch Business Offices - 11 years - still in use

Abrasion tests run on the Taber Abraser Machine, using H-22 wheels and 1000-gram weights, indicate that the Herculon fibre now being used for classroom carpeting has substantially higher resistance to abrasion of the type developed in a testing machine than do the wool fibres.

It therefore seems to be on the conservative side to assume a service life of 12 years for the Herculon Carpet now being used for classroom and other school installation.

While tests of resilient flooring show wide variations between products of different manufacturers, it appears that the higher testing resilient flooring materials will withstand approximately 60% more abrasion cycles than the Herculon carpet and that the relationship of 12 years for carpet to 20 years for resilient flooring is reasonable as applied to materials used in this District.

MATERIAL COSTS

The installed cost of various flooring materials, at first glance, would appear to be a very simple matter of obtaining recognized industry figures for the particular type and quality of the materials being compared. However, the comparison becomes complicated when we consider maintaining a comparable sonic classroom environment with two entirely dissimilar materials. Here, again, we are only concerned with our local situation - namely to produce a classroom with the same sonic environment and of the size and type that we are now building. Teacher reaction indicated that they believe the carpeted classroom without acoustic tile on the ceiling to be at least equal, if not superior, to the resilient floored room with acoustic tile of the type regularly installed in the District. The following costs are actual net bid prices on new construction used by the successful low bidder in compiling his bids on these projects. They do not include General Contractor's overhead. Bond and Insurance costs or profit which, depending on competitive conditions, may vary from 10% to 15% and would probably average approximately 12½% in compiling the bid submitted.

	Price Per Square Foot		
	Taft High	Group 208	Group 118
Carpet (Brampton Herculon)	.75	.65	.68
Painting Ceilings	.15	.15	.10
Total	.90	.80	.78
Vinyl asbestos tile	.29	.33½	.33½
Acoustic tile ceiling	.35	-	.27-4/10
	.64	.33½	.60-1/10
2nd floor construction			
Sheathing	(5/8) .260 (1-1/8)	.37 (1-1/8)	.37
Plywood Cleats	.024	-	-
Screws for Cleats	.008	-	-
Insulation (1" Microlite)	-	.09¼	.12½
Lightweight Concrete	.228	-	-
	.52	.46¼	.49½

Further checks with the industry indicate that the above prices for the Taft High job are conservative and representative of competitive prices now being bid. The relative costs of a standard classroom of 896 square feet based upon these unit costs are as follows:

	Carpet		Resilient		Difference
	Unit	Cost	Unit	Cost	
Materials installed	.75	672.00	.29	259.84	
Acoustic tile ceiling			.35	313.60	
Paint plaster ceiling	.15	134.40			
		806.40		573.44	
Contractors' overhead and Profit - 12½%		100.80		71.68	
Total		907.20		645.12	262.08

(Continued)

	Carpet Unit	Carpet Cost	Resilient Unit	Resilient Cost	Difference
Second floor rooms with resilient flooring require special sound insulation in the floor construction. The minimum installation now in use is -					
1" Microlite Blanket			.10	89.60	
Contractor's overhead and Profit - 12½%				11.20	
Sub Total				100.80	
Total Cost for Second Floor Rooms Only		907.20		745.92	161.28

(Attention is called to the fact that these figures are a comparison of costs of producing comparable sonic environment in the classrooms and are not a direct comparison of costs of floor covering only.)

REHABILITATION PROJECTS

The rehabilitation of buildings constructed before the 1933 earthquake to conform to the requirements of Title 21 of the Government Code has been a matter of concern to the Board of Education ever since the passage of the Field Bill in 1933.

There has been an increasing resistance on the part of the Instructional Staff to the rehabilitation program, it being felt that even though complete replacement might cost substantially more than rehabilitation, it was a better utilization of available funds. The degree of resistance is, of course, contingent upon the extent to which the rehabilitated unit meets present standards. Academic classrooms of equivalent area, fixtures, and finishes are generally acceptable. Special facilities, such as Science laboratories, Home Economic units, etc., are difficult to develop due to the 24-foot width of classrooms in the older buildings which is not sufficient to permit installation of modern perimeter seating. Alteration of old buildings to provide modern Administrative office layouts is difficult since it involves substantial partition rearrangement, relocating electric lights and convenience outlets, plumbing, etc., and generally develops a somewhat "patched up" feeling.

The "Patched up" atmosphere is one that to a greater or lesser degree is applicable to all rehabilitated units. Generally, the structural design for rehabilitation requires removal of sections of flooring approximately two feet wide along supporting walls. Also, nonbearing partitions are relocated to provide classrooms of the present 896 square foot area, thus leaving additional open spaces in the finished floor surface. The patching of the flooring presents a difficult matching job in maple flooring and an almost impossible matching problem in resilient flooring.

There is also a problem of "levelling" the floors which is necessitated because of normal wear, shrinkage of supporting wood members or because of uneven settlement of the structure.

Carpet installation in these rehabilitated buildings presents the following advantages over other types of floor covering.

1. The "prestige" aspect of carpeting carries over to the building itself, thus making it more acceptable to the instructional staff. (This aspect

is evident at 24th Street School where the Principal indicated that the teachers who had transferred out of the old frame building to the newly constructed main building in 1966, are now requesting to return to the old frame building with the carpeted floors.)

2. The overall covering aspect of the carpet with 40 oz. pad installation greatly simplifies the patching and leveling of existing floors.

The material installed cost differential of carpeting in rehabilitated buildings is greater than that for new construction as the sonic environment problem has generally already been taken care of by the prior installation of acoustic tile ceilings. While the floor patching may be simplified, it is difficult to assign any specific value to this item and therefore, cost considerations should be made on the basis of installation costs of the various floor treatments under consideration without any offsetting costs for omitting acoustic ceiling or sound insulation blankets such as are possible on new construction.

OPERATION OR CUSTODIAL COSTS

There are four kinds of costs that affect total custodial costs for any kind of flooring (referred to as Maintenance costs in many Industry Publications). They are (1) custodial labor costs (2) Expendable supplies costs (3) Capital equipment costs and (4) Equipment - repair and upkeep costs. It is generally conceded that custodial labor is the largest single item and in our District represents approximately 97% of the total annual custodial costs. Custodial supplies are approximately 2-6/10% with the balance going for repair and replacement of operational equipment.

The custodial labor costs are primarily dependent on the frequency and type of cleaning functions performed. Designated classroom cleaning schedules now in effect in the Los Angeles City Schools are:

1. Rooms with Resilient Floor Covering

Floor treatment:	Dry mop	Daily
	Mop and redress	Yearly
	Emergency spot removal	As needed
Dusting:	Flat top surfaces	Weekly
	Complete furniture	3 times a year
	Venetian blinds	3 times a year
	Ceiling and high surfaces	Yearly

2. Rooms with wall-to-wall carpeting

Floor treatment:	Complete vacuum	Weekly plus 3 vacations
	Paper pickup and traffic lane vacuum	4 times weekly (Days not completely vacuumed)
	Emergency spot removal	As needed
Dusting:	Flat top surfaces	Weekly
	Complete furniture	3 times a year
	Venetian blinds	3 times a year
	Ceilings and high surfaces	Yearly

It should be noted that the Los Angeles District has been operating on a minimal schedule due to cuts in custodial allotments occasioned by financial limitations and that indications are that further reduction may be necessary in 1967-68. The following is a comparison of the suggested schedules included in publications of the Carpet Institute and the Armstrong Cork Company with schedules now in effect in the Los Angeles City Schools.

		Carpet Institute "Cutting Costs with Carpet"	Armstrong "A Fresh Look at Flooring Costs" NSSA	School Operations Supervisory
			Annual Frequency	
	OPERATION	(1)	(1)	(2)
CARPET	Spot Vacuuming (traffic lanes)	208	208	140 *
	Complete Vacuuming with wand type vacuum	26		
	Complete Vacuuming with Upright	26	50	40 *
				+ 3 vacation
	Stain Removal	52	52	As needed
				(40) **
	Pile Lifting	3	3	-
	Wet cleaning with shampoo solution	.5	2	1/3 year ***
	Dry cleaning with dry shampoo powder	1.25	-	
RESILIENT TILE	Dust Mopping	260	260	180
	Damp Mopping (Spot mopping)	52	-	As needed
				(40) **
	Dry Buffing	52	-	-
	Stripping (Removing old finish) and Refinishing	6	2	1
	Spray Buffing (Buffing and applying spray solution of finish to badly worn or scuffed areas)	52	-	-
	Reconditioning (Damp mopping and buffing while damp)	26	-	-
	Wet Mop and Rinse	-	40	-
	Clean and Recoat	-	10	-

(1) Based on a full year of 52 weeks.
(2) Based on a school year of 40 weeks.
* Complete vacuum weekly - spot vacuum other days.
** Assumed an average of weekly in each classroom.
*** Assumed an average of once every three years, based on District experience with present installations.

Time and motion studies were made by Operations Branch personnel to obtain an up-to-date check or average production output of Custodial employees. Parallel tests were performed using vinyl asbestos tile and carpeted first floor classrooms at Fourth Street School. These classrooms are side by side - same size and with almost identical equipment and with comparable instructional programs. The production units developed are:

	Average Time Classroom 28 x 32 896 sq. ft.	Assumed Production Unit Classroom	1,000 Ft.
Resilient Flooring			
Dust Mop	12 min. 55 sec.	13 min.	14.6 min.
Spot Mop	5 min. 10 sec.	5 min.	5.6 min.
Complete Mop	39 min. 55 sec.	40 min.	45.0 min.
Apply Floor Dressing	7 min. 20 sec.	7 min.	7.4 min.
Carpeted Floors			
Complete Vacuum	27 min. 50 sec.	30 min.	33.8 min.
Paper Pickup - Entry	4 min. 20 sec.	5 min.	5.6 min.
Shampoo Carpet *			2 hours

* From Shampoo job at 24th Street School

The following is a comparison of the production units included in the publications of the Carpet Institute and the Armstrong Cork Company with those developed by the Operations Branch based on local conditions, methods and standards.

		Minutes per 1,000 sq. ft.		
	OPERATION	Carpet Institute "Cutting Costs with Carpet"	Armstrong "A Fresh Look at Flooring Costs" NSSA	School Operation Time and Motion Study
C	Spot Vacuuming (traffic lanes)	5.195	22.0	5.6
A	Complete Vacuuming with wand type vacuum	8.975	-	-
R	Complete Vacuuming with Upright	18.0	70.0	33.8
P	Stain Removal	4.135	4.13	
E	Pile Lifting	20.0	20.0	
T	Wet Cleaning with Shampoo Solution	240.0	300.0	240.0
	Dry Cleaning with dry shampoo powder	180.0	-	
R	Dust Mopping	4.99	15	14.6
E	Damp Mopping	19.99	-	
S	Dry Buffing	20.01	-	
I	Stripping (Removing old finish and refinishing)	299.89	150	
L	Spray Buffing (Buffing and applying spray solution of finish to badly worn or scuffed areas)	29.98	-	
E	Reconditioning (Damp mopping and buffing while damp)	45.14	-	
N	Wet Mop and Rinse		35	
T	Clean and Recoat		100	
T	Mop and apply Floor Dressing			52.4
I	Spot Mop (Emergency spot removal)			5.6
L				
E				

The comparative annual custodial costs applicable to cleaning of floor covering in the Los Angeles District are:

1. Classroom with Resilient floor covering		
Dust Mop Daily	180 @ 13 min.	2,340 min.
Emergency Spot Removal	40 @ 5 min.	200 min.
Mop and Apply Floor Dressing	1 @ 47 min.	47 min.
		2,587 min.
		43.12 hrs.
Annual cost @ Productive Hourly Rate $2.96		$ 127.64
2. Classroom with Wall-to-Wall Carpeting		
Complete Vacuum	43 @ 30 min.	1,290 min.
Paper Pick-up - Traffic Lane	140 @ 5 min.	700 min.
Emergency Spot Removal	40 @ 5 min.	200 min.
Shampoo (every 3 years)	1/3 @108 min.	36 min.
		2,226 min.
		37.10 hrs.
Annual cost @ Productive Hourly Rate $2.96		$ 109.82
Difference		$ 17.82

The relative level of appearance under present Los Angeles schedules definitely favors the carpet installation. This is largely due to the rubber burn marks which are very apparent on most of the resilient tile floors. These seem to be due to rubber soles and heels (largely manufactured from reclaimed rubber) on students' shoes and are most apparent on light colored tile used by many Architects. The Operations Branch has been studying this problem for several years and has tried numerous methods of removal without too much success. The method which produces the best appearance is a nightly cleaning and buffing which is extremely expensive and in areas such as the main corridor of John Adams Junior High School is only effective until about the second class period when heavy passing traffic has re-marked the floor. By noon it is difficult to believe that the floor had been cleaned and buffed the night before.

The following is a definition of "Desired Appearance Levels" as set forth in the Wharton School of Finance and Commerce Report.

1. 70 per cent appearance level
   a. Resilient Floor -- Many noticeable spots and heel marks in traffic lanes of floor. Gloss is low except for edge areas.
   b. Carpet -- Low matted pile in traffic lanes, dull color and many noticeable spots in the area.

2. 85 per cent appearance level
   a. Resilient Floor -- A few heel marks and spots in traffic lanes. Floor has medium gloss except in heavy traffic lanes.
   b. Carpet -- Pile is high except in heavy traffic lanes, relatively dull in color with very few noticeable spots.

3. 95 per cent appearance level
   a. Resilient Floor -- Very few heel marks in traffic lanes. No noticeable spots and high gloss over entire floor.
   b. Carpet -- Pile is high in all areas, color is bright and there are no noticeable spots or dirt on floor.

The following rating of appearance levels in schools is based on observation at various schools. Resilient flooring varies from a 65% appearance level in some corridors to 70% in classroom. Average condition 70%. Carpet flooring varies from an 80% level in one corridor to a 95% level in some classrooms. Average condition 90%.

EQUIPMENT REQUIREMENTS

Most of the working tools used by custodians in the care of floor covering, including mops, brooms, pails, etc., are classified as nonconsumable supplies in the California School Accounting Manual.

The following is the list of items relating to floor care that are so classified and are included in the standard list of equipment furnished to schools of the Los Angeles District.

	Number Furnished	
	Elementary School	Jr. & Sr. High
Floor Scrubbing and Polishing Machine 17"	-	-
Vacuum Cleaner - Cannister Type or Mobile Base, With Attachments	1	1
Vacuum Cleaner, Wet or Dry Pickup, Tank Type with 28" Squeegee and Attachment for Dry Pickup	-	1
Vacuum Cleaner Attachment for Cleaning chalkboard Erasers	-	1

NOTE: Units not furnished to elementary schools are available in the Maintenance and Operations Area Headquarters for use as needed in the schools during vacation period cleanup. Shampoo units are also available in the Areas for use by all schools as needed.

The cannister type vacuum is used for cleaning rugs, drapes, venetian blinds, etc. The wet or dry vacuum is used for cleaning operations on ceramic tile as well as resilient flooring. In schools with wall-to-wall carpeting it can also be used with attachments for shampoo purposes. However, for regular vacuuming of substantial amounts of wall-to-wall carpeting, a heavy duty beater type vacuum cleaner is substituted for the cannister-wand type regularly furnished. This represents an additional cost of approximately $75.00 in the equipment for a new school. The Operations Branch indicates that the life of the heavy duty unit is approximately 10 years as compared to approximately 5 years for the cannister type and that the average cost of repairs of the two units over a 10-year period is about the same. It is, therefore, felt that there would be no material difference in average equipment costs between schools with resilient flooring and schools with wall-to-wall carpeting in our District.

ANNUAL SUPPLY REQUIREMENTS

An analysis of the before and after carpet installation use of supplies in schools indicates the major items of supply requirement for present standards of care per classroom per year are as follows:

Resilient floors		
Polymer floor dressing	2 gals. @ 1.60	$ 3.20
Floor washing compound	1 gal. @ .93	.93
Dust mop head replacement	Average 1/4 head @ 2.00	.50
Dust mop treatment	1/6 gal. @ 1.20	.20
Total		$ 4.83
Carpeted floors		
Spotting kit	Average 1/3 kit @ 6.00	$ 2.00
Shampoo compound (8 oz. unit)	2 @ .75	1.50
Total		$ 3.50
Difference		$ 1.33

MAINTENANCE OR REPAIRS

The California School Accounting Manual defines charges to Maintenance of Plant as those items of repair or replacement required to return a unit "to approximately its original condition of completeness and efficiency." It does not include "such housekeeping activities as are repeated somewhat regularly on a daily, weekly, monthly or seasonal basis," which are charged to Operation of Plant. In general, maintenance or repair items occur less frequently than once a year.

The flooring unit of the Maintenance Branch indicates that the floor covering of a complete classroom or other space is replaced periodically at the end of its useful life and that, in general, the only repair that is done otherwise consists of the replacement of small panels at the door entries which become badly worn due to the turning action of a person entering the room. Resilient flooring is repaired in this manner about every five years. The repair involves approximately 1/2 box of tile for each doorway and at the present time costs approximately $26.00 per doorway.

The Business Division elevator installation has been used to test a number of flooring materials under concentrated abrasive wear. (Passengers enter the elevator and make a 180° turn which is approximately double the abrasive action of that of a person entering a classroom.) The results of these tests indicate that the cushioning action of the carpet installation makes it more resistant to this type of wear than the harder surfaced resilient flooring. Considering these tests, as well as the District's limited experience with carpeted offices, lobbies, etc., it is felt that the repair problem of carpeted areas from normal wear would be no more than that now experienced with resilient flooring. Carpeting is more subject to abuse from vandalism than resilient flooring, but percentagewise this has never been a serious problem in the District.

Therefore, it has been assumed for purposes of this study that the average annual maintenance or repair costs of the two types of floor covering between times of complete replacement would be a stand off.

Summary of Cost Data:

The following is a summary of cost data developed in previous sections of this report:

1. "Material Installed" Costs (896 sq. ft. classroom)
   a. Floor covering first cost only - Carpeting costs approximately $400. more per classroom than resilient floor covering (both based on present Los Angeles District specifications)
   b. Classroom of similar sonic environment
      1st floor classroom $262. more for carpet
      2nd floor classroom $161. more for carpet
   c. Average annual additional "material installed" cost of carpet based on its assumed life of 12 years
      1st floor classroom $21.84
      2nd floor classroom $13.44

2. Average annual custodial labor costs per classroom.

   Custodial labor costs, based on the present designated schedule of floor care, time and motion study production units, and existing fourth step production hourly rate for custodians, are Resilient flooring $127.64 per year, Carpeted classroom $109.82 per year, or a difference of $17.82 more for Resilient floored classroom.

3. Average annual custodial equipment costs.

   The Board presently provides custodial equipment which can be utilized for care of Carpet floor covering. While some changes seem desirable where carpeting is installed throughout a school, it is felt that no significant difference in average annual equipment cost would result.

4. Average annual custodial supply costs.

   Based on the Board's present practice, the major items of supply cost per classroom are Resilient floors $4.83 per year, Carpeted floors $3.50 per year or a difference of $1.33 more for Resilient flooring.

5. Average annual repair costs.

   Based on the Board's experience and assuming replacement of floor covering on the basis of an average of 12 years for Carpet and 20 years for Resilient flooring, the only repairs not resulting from vandalism would be replacement of small panels at door entries on about a five-year basis. It was felt that there would be no material difference of cost for work.

The summation of these costs, considering material and installation cost, custodial labor and custodial supplies, indicates the following annual difference in cost. (Based on first 12-year period - Carpet life)

1.	For first floor classroom	$2.69 per year more for Carpeting
2.	For second floor classroom	$5.71 per year more for Resilient
3.	For combination first and second floor classrooms	$1.51 per year more for Resilient

Attention is called to the fact that computations based on longer periods than the 12-year annual service life of Carpet will produce different annual costs. The problem is complicated by the fact that anticipated service lives of the materials involved vary and the first time that the theoretical replacement of both Carpet and Resilient flooring occurs at the same time is at 60 years.

Replacement of Carpeting will not involve replacement of the tackless strip, and experience in the Los Angeles City School District indicates that a substantial amount of the Carpet removed will be salvaged for use in alteration work and other minor jobs. On the other hand, replacement of Resilient flooring produces no salvage and requires extensive floor cleaning and treatment before laying the new tile. Present contract figures for this work are approximately 37¢ per sq. ft. as compared to the 29¢ per sq. ft. bid on new work.

Fire Department regulations require flame retardent paints on fibreboard acoustical tile ceilings. The material cost involved is approximately $24.00 more per classroom than for wall paints which are used on plaster ceilings.

Fibreboard acoustical tile glued on to a plaster ceiling requires a certain amount of replacement and/or regluing of loose tile. The exact amount of this work is difficult to calculate as Maintenance records are not maintained separately for this type of work which is normally done on a minor repair job number.

Considering all factors, it is probable that the annual classroom difference in costs over a 60-year period would slightly favor Resilient flooring over Carpet.

However, very minor changes in unit prices due to changing market conditions could readily throw costs one way or the other. It is, therefore, felt that a more conservative conclusion would be that under present (1) Board standards of cleanliness, (2) efficiency of custodial staff and (3) market conditions, there is no significant difference in average annual costs of newly constructed classrooms of similar sonic environment regardless of the type of floor covering installed.

REACTIONS TO CARPETED CLASSROOMS

The Bureau of Educational Research and Service of the College of Education, The Ohio State University, published the results of a study on "Carpeting and Learning." The results of that study were summarized by Principal Blose of the Oakland Public Schools as follows:

"a. Purpose of Study: This study was made to determine how carpeting affected the total sonic environment and whether or not it had any effect upon pupil behavior and learning. The basic premise was that carpeting, in a classroom, could be justified only if it produced desirable differences in the physical environment and in the resulting behavior and learning of pupils. The study was designed to measure:

(1) Achievement: By the California 1957 WXYZ Achievement Test.
(2) Personal and social characteristics: By the California Test of Personality, Forms AA and BB.
(3) Sonic environment: By tape recording and sound-measuring devices.
(4) Pupil behavior: By actual classroom observation.
(5) The attitudes of pupils, teachers and parents: By interview.

"b. Scope of study: Grades 1 through 6 were selected for application of the study, involving approximately 360 students, with the study encompassing a full school year.

"c. Results of study: Achievement tests were given at the beginning and end of the project. It was found that:

(1) Grades 1, 2, 3, and 5, in carpeted classrooms, had a greater mean yearly growth in achievement than comparison pupils in non-carpeted rooms.
(2) Grade 4 had less achievement growth in carpeted classrooms.
(3) In grade 6, the pupil growth pattern evidenced no change.
(4) When all grade groups were included in the analysis, the pupils in the carpeted rooms had a greater mean yearly growth than their counterparts in the non-carpeted rooms, but the difference was not statistically significant.
(5) Personal and social achievement tests were given at the beginning and end of the project. Results were analyzed by primary (1-3), intermediate (4-6) and total elementary grade groups (1-6). It was found that pupils in four of the six grades and in the primary, intermediate and total elementary grade groups showed greater personality development than their counterparts in non-carpeted rooms. The difference, however, was not satistically different. Results were classed as not surprising as significant changes in personality seldom take place over short periods of time.

"d. Sonic environment:

(1) Reverberation time: Measurements of reverberation time, the time

necessary for a loud sound to decay 60 decibels from its original value, were made in the classrooms prior to and after installation of carpet. It was found that carpeting reduced the reverberation time to an average of one second.

(2) Sound pressure levels: Equal time samples of acoustical events were taken simultaneously from pairs of classrooms, carpeted and non-carpeted. Mean sound levels were calculated for the various samples of room noises, for an octave frequency spectrum of the samples, and for parts of the samples selected on a common activity basis. It was found that the analysis of matched samples, on a common activity basis, clearly favored the carpeted classroom. It was also found that matching samples, on a common activity basis, resulted in relatively few comparable samples which prevented adequate statistical treatment. Even though the analysis of random samples showed a difference in sound pressure level of the carpeted and non-carpeted rooms, a further statistical analysis cast doubt on the findings. Two inferences were drawn from the available data:

(a) Generally, high and low frequency sounds were lessened in the carpeted rooms, but the speech frequencies were not similarly reduced.
(b) If it is assumed that learning is facilitated in an environment where communication is facilitated and undesirable sounds reduced, carpeting can have a positive effect on the learning environment.

"e. Pupil behavior: Behavior was evaluated by two trained observers who spent 200 man-hours, in various classrooms, observing 24 different types of student and teacher behaviors. The various activities of students and teachers, such as looking up, student leaving chair, or teacher relocating child, were noted and catalogued. An analysis of the 14 most frequent types of behavior failed to produce measurable differences in observable behavior patterns of students or teachers favoring either carpeted or non-carpeted rooms.

"f. Parents' views relative to carpet use: Parents of all students involved in the study were interviewed, before and after the study, to determine their attitudes. The conclusion was drawn that parents generally liked carpeted classrooms.

Views	Views Before Carpet Use	Views After Years of Use
Surprised, no comment	13%	0%
Unhealthy	3	4
Unneeded	7	7
Too expensive	5	4
Too hard to keep clean	15	4
Silly, poor idea, impractical	11	2
Nice, good idea	32	57
Healthy	1	0
Other	13	22
Totals	100%	100%

"g. Teachers' opinions: Casual interviews, during the project, and a formal interview, at its completion, indicated teachers to be 100% in favor of continuing carpeted classrooms. Most of them stated that they were less fatigued at day's end. Teachers of the first three grades had students sit on the floor for reading circles and playing 'tip-toe' games. Some teachers reported that the carpeted rooms were warmer and that falling objects created little distraction. One complaint was that carpeting muted the sound of movement so much that, sometimes, students could leave the room without detection.

"h. Summary: The Ohio State University study revealed that carpeted classrooms provided a measurably superior sonic environment to non-carpeted classrooms and that this superiority was reflected in significantly greater pupil achievement only in the primary grades."

It was felt desirable to obtain teacher reaction in the Los Angeles Schools to questions similar to those covered in the Ohio State study. This was done by means of a questionnaire (Exhibit 1 attached) and replies were received from all certificated personnel at Aragon and 24th Street Schools as well as the teachers in the new two-story units at Fourth Street Schools (one of the units has classrooms with resilient floors and acoustic tile ceiling while classrooms in the other unit are carpeted with painted gypsum board ceilings). Replies were also received from the Elementary Associate and Assistant Superintendents. The following is a summary of the replies.

Summary of Questionnaire

Replies from Certificated Personnel - Aragon Avenue School, 24th Street School, 4th Street School, Elementary Associate and Assistant Superintendents.

	First Reaction on hearing that wall-to-wall carpeting was to be installed in certain areas in your school?	Reaction after seeing the wall-to-wall carpeting in use for approximately a year?
Amazed, surprised or stunned	52	17
Impractical, silly idea	13	5
Not needed	9	5
Costs too much	14	4
Difficult to keep clean	45	24
Unhealthy, breeds germs	12	8
Might be worth trying	69	79
Will help the teaching program	72	78
Good idea, fine	67	78
Worth the cost	54	73

	Yes	No
(a) Does cost influence your thinking?	22	66

(b) Would any of your answers on page two have been different if you had known that over a 10 or 12 year period the average annual cost, including the carpet installation, the cleaning and custodial service, and the cost of repairs, was no more than the costs for resilient floor covering previously used?

Yes	No
15	80

TEACHERS AND PRINCIPALS ONLY

In your opinion:	Yes	No	No Opinion
1. Is a carpeted classroom more conducive to learning:	81	3	8
2. Is the sonic environment of carpeted classroom superior to the uncarpeted classroom with acoustical tile ceiling?	86		9
3. Is the classroom discipline better in a carpeted classroom than in the uncarpeted room?	69	7	10
4. Do students tend to pick up papers and keep the classroom cleaner than in the uncarpeted room?	58	10	25
5. Is there any hesitancy on the part of students and teachers in a carpeted classroom in performing regular classroom tasks, such as using tempera colors, etc.?	34	10	20
6. Do you feel that students' personal feelings about themselves and their social group are better in a carpeted classroom than in the uncarpeted room?	61	10	21

7. In your opinion, what is the reaction to carpeted classrooms of:

(a) Students: Favor 81 Oppose ____ No Noticeable Reaction 9
(b) Parents: Favor 57 Oppose 4 No Noticeable Reaction 22

During Public Schools' Week, a number of business men from the community were meeting with the Principal of 24th Street School and arrangements were made to obtain their reaction to the questions on the first two pages of the questionnaire. Questionnaires were not to be signed but the following identification of lines of endeavor were shown on the replies.

1 Taxpayer
1 Bank President
1 Bank Manager
1 Realtor
1 Safeway Store Manager
1 Urban Affairs Consultant
4 N.A.P.P. Program
1 Minister
1 Life Insurance Official
1 Merchant
2 National Negro Foundation
1 Administrative Assistant to the Mayor
1 L.A.P.D. Representative

When they first came to the school he requested them to react to the questions on the first page and then to put the questionnaire in their pockets. After touring the plant and observing the educational process in all areas, carpeted and not carpeted, they were requested to react to the second sheet. Their replies are summarized as follows:

	First reaction when you heard that wall-to-wall carpeting was to be installed in certain areas in your school?	What is your reaction after seeing the wall-to-wall carpeting in use?
Amazed, surprised or stunned	11	5
Impractical, silly idea	3	-
Not needed	2	3
Costs too much	4	4
Difficult to keep clean	6	8
Unhealthy, breeds germs	3	9
Might be worth trying	12	12
Will help the teaching program	7	14
Good idea, fine	9	16
Worth the cost	7	13

Personal interviews were conducted with school personnel as a part of this study. The following additional reactions are typical.

1. Classroom doors to carpeted corridors may be left open - even during passing periods - thus solving the ventilation problem created by closing transoms on fire department orders.

2. The same noise level is soft and not disturbing to the ear in a carpeted classroom while it is harsh and unpleasant in the room with resilient floor covering and acoustic tile ceiling.

   Note: The above reaction seems to be substantiated in that generally the classroom doors in carpeted classrooms were open while doors to resilient floored rooms in the same school were generally closed.

3. Teachers generally were concerned over the problem of cleaning up spilt watercolors, clay and other instructional materials. The hesitancy to use normal teaching material was generally overcome as soon as the cleaning characteristics of the carpeting material were known. Teachers reported that children reported spilt material immediately in carpeted rooms but did not always do so in rooms with resilient flooring. This, of course, may be due to the newness of carpeting.

4. Some difficulty in small children moving chairs on carpeted floors was reported. This seemed to be with chairs with small glides while chairs with the large glides could be pushed about without trouble.

5. Teachers generally indicated less fatigue at the end of the day when teaching in a carpeted room.

6. There was agreement that the general appearance level of carpeted areas was superior to that of the resilient floor areas. This is directly related to the rubber burn problems more fully covered in the Custodial Costs section of this report.

7. Custodians stated they would rather take care of the carpeted classroom as it looked better and took less time. However, no change has been made in the overall custodial assignments at any school. Computations based on time and motion data indicate minor savings under the present District standards. Custodian reaction is probably largely due to pride in their work and the improved appearance level of the carpeted classroom.

CONCLUSIONS:

The first reaction of most people to any statement regarding installation of carpeting in school classrooms is one of surprise coupled with a feeling that its cost is excessive as compared to that of more common floor coverings used in schools. When we use comparative costs we must determine and define the exact costs we are using.

The first or "material installed" cost of carpet floor covering is considerably more than that of resilient floor covering. However, when the floor covering is considered as only one part of a classroom of similar sonic environment, as is the present practice in the Los Angeles District, the differential is substantially reduced. Furthermore, if average annual costs including custodial service on the basis of present District standards are to be used there is no significant difference in cost of the two types of floor covering when installed in new buildings in a manner to provide similar sonic environment of the classroom and the selection of floor covering should be made on some other basis than cost alone.

The following conclusions based on data developed in the study are among the items that should be given consideration in selection of floor coverings.

1. From the standpoint of the teachers, the sonic environment in the classroom with carpeted floors and painted hard surface ceiling is superior to the classroom with Resilient floor covering and acoustic tile ceilings.

2. Carpeting of the second floor of two-story wood frame buildings solves the problem of noise transfer to first floor rooms and no sound insulation blanket between floors is necessary when carpeting is used.

3. The general appearance level of carpeted floors in our schools is much higher than for vinyl asbestos tile. This is largely due to the problem of rubber burn marks on the Resilient flooring.

4. At first there is some hesitancy on the part of teachers and students in performing regular classroom tasks, such as using tempera colors, etc., but this is quickly overcome after the carpet has been in use a short time.

5. Teacher reaction indicates that they believe the carpeted room is more conducive to learning.

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